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EXAMINER

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ART UNIT

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**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Application Number: 10/032,523
Filing Date: October 19, 2001
Appellant(s): LIU ET AL.

RANDY W. TUNG
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 15 June 2004.

MAILED
SEP 02 2004
GROUP 2800

(1) *Real Party in Interest*

A statement identifying the real party in interest is contained in the brief.

(2) *Related appeals and Interferences*

The brief does not contain a statement identifying the related appeals and interferences which will directly affected or be directly affected by or have a bearing on the decision in the pending appeal is contained in the brief. Therefore, it is presumed that there are none. The Board, however, may exercise its discretion to require an explicit statement as the existence of any related appeals and interferences.

Art Unit: 2871

(3) Status of Claims

The statement of the status of the claims contained in the brief is correct.

(4) Status of amendment After Final

The appellant's statement of status of amendments after final rejection contained in the brief is correct.

(5) Summary of Invention

The summary of invention contained in the brief is correct.

(6) Issues

Issue I

The rejection of claims 1,3, 10, 12, 14 and 16 under 35 U.S.C. 103(a) as being unpatentable over Saito et al. '308 in view of Lu et al. '786 is correct.

Issue II

The rejection of claims 4 and 17 under 35 U.S.C. 103(a) as being unpatentable over Saito et al. '308 in view of Kim et al. '794 is not correct.

Instead, the rejection of claims 4 and 17 is under 35 U.S.C. 103(a) as being unpatentable over Saito et al. '308 in view of Lu et al. '786 and in further view of Kim et al. '794.

Issue III

The rejection of claim 5 under 35 U.S.C. 103(a) as being unpatentable over Saito et al. '308 in view of Iwaki et al. '432 is not correct.

Instead, the rejection of claim 5 is under 35 U.S.C. 103(a) as being unpatentable over Saito et al. '308 in view of Lu et al. '786 and in further view of Iwaki et al. '432.

Issue IV

The rejection of claim 6 under 35 U.S.C. 103(a) as being unpatentable over Saito et al. '308 in view of Lu et al. '786 and in further view of Bischel et al. '268 is correct.

Issue V

The rejection of claim 7 under 35 U.S.C. 103(a) as being unpatentable over Saito et al. '308 in view of Lu et al. '786 and in further view of Rosenblatt et al. '358 is correct.

Issue VI

The rejection of claims 8 and 18 under 35 U.S.C. 103(a) as being unpatentable over Saito et al. '308 in view of Lu et al. '786 and in further view of Akimoto et al. JP '522 is correct.

Issue VII

The rejection of claims 9, 11 and 19-20 under 35 U.S.C. 103(a) as being unpatentable over Saito et al. '308 in view of Lu et al. '786 is correct.

Issue VIII

The rejection of claim 13 under 35 U.S.C. 103(a) as being unpatentable over Saito et al. '308 in view of Lu et al. '786 and in further view of Nishio et al. '547 is correct.

(7) Group of Claims

The rejections of claims 1, 3-14 and 16-20 stand or fall together.

(8) Claims Appealed

The copy if the appealed claims contained in the Appendix to the brief is correct.

(9) Prior Art of Record

The following is a listing of the prior art of record relied upon in the rejection of claims under appeal.

Applicant's Prior Art

US6304308	Saito et al.	10-01
US6426786	Lu et al.	07-02
US6525794	Kim et al.	02-03
US5646432	Iwaki et al.	07-97
US5544268	Bischel et al.	08-96
US5477358	Rosenblatt et al.	12-95
US6046547	Nishio et al.	04-00

JP361215522

Akimoto et al.

09-86

(10) Grounds of Rejection

The following grounds of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 103

Claims 1, 3 10, 12,14 and16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Saito et al. (US6304308B1) in view of Lu et al. (US6426786B1).

In regard to claims 1, 10, 12 and 14, Saito et al. teach (Figs. 1 and 10A-C) a liquid crystal on silicon structure incorporating integrated spacers and silicon light valves comprising:

- a silicon substrate SUB1 having
 - a first multiplicity of pixel electrodes AL-P formed on a top surface;
 - a second multiplicity of integrated spacers SPC-P formed of an insulating material on said top surface of the silicon substrate in-between said first multiplicity of pixel electrodes;
 - a third multiplicity of silicon light valves formed on said top surface of the silicon substrate for orienting liquid crystal molecules;
- a glass substrate SUB2 that is optically transparent having an optically transparent electrode layer coated on a bottom surface positioned juxtaposed to and over said silicon substrate supported by said second multiplicity of integrated spacers forming a sealed cavity by engaging a perimeter seal

Art Unit: 2871

surrounding said two substrates, said sealed cavity encases said optically transparent electrode layer and said third multiplicity of silicon light valves therein; and a liquid crystal material filling said sealed cavity.

wherein

- each of said third multiplicity of silicon light valves being formed of a polysilicon tip and a dielectric material base (claim 10).
- each of said second multiplicity of integrated spacers having a height between about $0.5\mu\text{m}$ and about $10\mu\text{m}$ (claim 12) since the liquid crystal cell gap is about $4\text{-}7\mu\text{m}$ (col. 2 lines 10-12).

However, Saito et al. fail to disclose a liquid crystal comprising a multiplicity of multi-domain homeotropically aligned liquid crystal cell (claims 1 and 14) and a multiplicity of lines formed of insulating material protruding from said top surface of the lower substrate for forming a multi-domain homeotropically aligned liquid crystal cell (claims 3 and 16) for high contrast ratio, a good display quality, and a high photo-stability

Lu et al. teach (Figs. 5A-B) a liquid crystal comprising a multiplicity of multi-domain homeotropically aligned liquid crystal cell (claims 1 and 14) and a multiplicity of lines formed of insulating material protruding from said top surface of the lower substrate for forming a multi-domain homeotropically aligned liquid crystal cell (claims 3 and 16) for high contrast ratio, a good display quality, and a high photo-stability (abstract).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to further modify a liquid crystal as Saito et al. disclosed with a multiplicity of multi-domain homeotropically aligned liquid crystal cell and a multiplicity of lines formed of insulating material protruding from said top surface of the lower substrate for forming a multi-domain homeotropically aligned liquid crystal cell (claims 3 and 16) for high contrast ratio, a good display quality, and a high photo-stability (abstract).

Claims 4 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Saito et al. (US6304308B1) in view of Lu et al. (US6426786B1) as applied to claims 1, 3 10, 12,14 and16 in view of Kim et al. (US6525794B1).

Kim et al. teach (Figs. 3D and 4A-14B) a liquid crystal comprising a multiplicity of elongated recesses 43 formed in a metal layer on said top surface of the lower substrate for forming a fringe field homeotropically aligned liquid crystal cell for wide viewing angle by multi-domain and high brightness by stable arrangement of liquid crystal molecules.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to further modify a liquid crystal as Saito et al. disclosed with a multiplicity of elongated recesses 43 formed in a metal layer on said top surface of the lower substrate for forming a fringe field homeotropically aligned

Art Unit: 2871

liquid crystal cell for wide viewing angle by multi-domain and high brightness by stable arrangement of liquid crystal molecules.

Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Saito et al. (US6304308B1) in view of Lu et al. (US6426786B1) as applied to claims 1, 3 10, 12,14 and16 in view of Iwaki et al. (US5646432)

Iwaki et al. teach a liquid crystal with each of said liquid crystal cell having a square configuration with a dimension of each side about $20\mu\text{m}$, that is in a range between about $5\mu\text{m}$ and about $20\mu\text{m}$ for high speed (col. 15 lines 24-29).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to further modify a liquid crystal as Saito et al. disclosed with each of said liquid crystal cell having a square configuration with a dimension of each side about $20\mu\text{m}$, that is in a range between about $5\mu\text{m}$ and about $20\mu\text{m}$ for high speed

Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Saito et al. (US6304308B1) in view of Lu et al. (US6426786B1) as applied to claims 1, 3 10, 12,14 and16 in view of Bischel et al. (US5544268A)

Bischel et al. teach (col. 111 lines 52-57) a display panel with each of said liquid crystal cell having a square configuration with a distance to an immediate adjacent pixel less than $100\mu\text{m}$ that covers in a range between about $0.3\mu\text{m}$ and about $2\mu\text{m}$ for high resolution.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to further modify a liquid crystal as Saito et al. disclosed with each of said liquid crystal cell having a square configuration with a distance to an immediate adjacent pixel less than $100\mu\text{m}$ that covers in a range between about $0.3\mu\text{m}$ and about $2\mu\text{m}$ for high resolution.

Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Saito et al. (US6304308B1) in view of Lu et al. (US6426786B1) as applied to claims 1, 3 10, 12,14 and16 in view of Rosenblatt et al. (US5477358A)

Rosenblatt et al. teach (col. 2 lines 4-10) a liquid crystal material that fills said sealed cavity being a chiral-type liquid crystal for promoting homeotropic alignment of the liquid crystal and exhibiting a uniform homeotropic alignment substantially throughout the cell.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to further modify a liquid crystal as Saito et al. disclosed with a liquid crystal material that fills said sealed cavity being a chiral-type liquid crystal for promoting homeotropic alignment of the liquid crystal and exhibiting a uniform homeotropic alignment substantially throughout the cell.

Claims 8 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Saito et al. (US6304308B1) in view of Lu et al. (US6426786B1) as applied to claims 1, 3 10, 12,14 and16 in view of AKIMOTO et al. (JP361215522)

AKIMOTO et al. teach spacers being formed of silicon oxide for obtaining the titled apparatus having an excellent display quality.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to further modify a liquid crystal as Saito et al. disclosed with spacers being formed of silicon oxide for obtaining the titled apparatus having an excellent display quality.

Claims 9, 11 and 19-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Saito et al. (US6304308B1) in view of Lu et al. (US6426786B1) as applied to claims 1, 3 10, 12,14 and16.

Saito et al. also disclose the top surface of the silicon substrate being covered by a layer of metallic reflective film (col.6 lines 33-34) for reflecting light.

However. Saito et al. fail to disclose said reflective metal layer formed by a metal selected from the group consisting of Al, Ag and Al--Nd.

It is well known in the art that the reflective metal layer made of Aluminum (Al) for low cost and easily manufacturing.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to further modify a liquid crystal as Saito et al. disclosed with the top surface of the silicon substrate being covered by a layer of metallic reflective film for reflecting light and this reflective metal layer made of Aluminum (Al) for low cost and easily manufacturing.

Art Unit: 2871

Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Saito et al. (US6304308B1) in view of Lu et al. (US6426786B1) as applied to claims 1, 3 10, 12,14 and16 in view of Nishio et al. (US6046547A).

Nishio et al. teach a liquid crystal display with each of said third multiplicity of silicon light valves having a height between about 0.3 μ m and about 3 μ m for eliminating irregularities caused by the TFT and treatment of flattening (col. 5 lines 56-61).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to further modify a liquid crystal as Saito et al. disclosed with each of said third multiplicity of silicon light valves having a height between about 0.3 μ m and about 3 μ m for eliminating irregularities caused by the TFT and treatment of flattening.

(11) Response to Argument

Issue I

Applicant's arguments are follows:

1. "Since Saito et al (a primary reference) does not express any desire of a specific type or an improved liquid crystal material for use in his liquid crystal display device, there can be no motivation to combine the teachings of Lu et al (secondary reference) with Saito et al, and thus placing the multi-domain homeotropically aligned liquid crystal cells in the Saito et al's liquid crystal display device" (page 10 lines 8-14).

Art Unit: 2871

2. "Although the Examiner suggests that the Saito et al reference could readily be modified to include the Lu et al's reference, "the mere fact that the prior art could be so modified and would not have made the modification obvious unless the prior art suggested the desirability of the modification". In re Gordon, 733 F2d 900, 902, 221 USPQ 1125, 1127 (Fed.Cir. 1984). The Appellants respectfully submit that Saito et al does not suggest Lu et al's modification or provide any reason or motivation to make the modification" (page 10 line 15 to page 11 line 2).

Examiner's responses to Applicants' arguments are follows:

1. Since Saito et al. do not teach a specific type of "a multiplicity of multi-domain homeotropically aligned liquid crystal cells" cited in claims 1 and 14, examiner uses a secondary reference of Lu et al., which discloses in the abstract the specific type of "a multiplicity of multi-domain homeotropically aligned liquid crystal cells" to fulfill the rejection of claim 1 and 14 under 35 U.S.C. 103(a) as being unpatentable over Saito et al. '308 in view of Lu et al. '786.

Since this is an obvious rejection under 103(a), **any express of desire for improving or motivation to combine the Lu et al. with Saito et al. should be found or disclosed in the secondary reference of Lu et al.** (not in the primary reference of Saito et al.).

The express of any desire or motivation of "a multiplicity of multi-domain homeotropically aligned liquid crystal" for improving "contrast ratio, display quality, and

Art Unit: 2871

photo-stability” **is found or disclosed in an abstract of the secondary reference of Lu et al.**

2. As rejection under 103(a), a primary reference of Saito et al. does not have to suggest **any modification, which is found or disclosed in a secondary reference of Lu et al.** With a replacement of “any domains liquid crystal” of Saito with “multi-domain homeotropically aligned liquid crystal” of Lu et al., **the LCD device of Saito is still operable for improving** “contrast ratio, display-quality, and photo-stability”.

Furthermore, case of In re Gordon 733. F2d 900, 902 USPQ 1125, 1127 (Fed. Cir. 1884) raises different issues [“claims were *prima facie* obvious, reasoning that it would have been obvious to turn the primary reference upside down”. The court reversed, finding that if the prior art device (in primary reference) was turn upside down it should be inoperable].

Issue II

Applicant's arguments are follows:

Claim 4 depends on independent claim 1 while claim 17 depends on independent claim 14. The Appellants have clearly shown that the newly amended independent claims and 14 recite the additional limitation of "a multiplicity of multi-domain homeotropically aligned liquid crystal cells", which is not taught or disclosed by either Saito et al or Kim et al (4th paragraph on page 11).

Art Unit: 2871

Examiner's responses to Applicants' arguments are follows:

Here again, the rejection is under 35 UCS 103(a), Examiner relies on Lu et al. to teach an additional limitation of "a multiplicity of multi-domain homeotropically aligned liquid crystal cells" as addressing in Issue I above.

Claims 1 and 14 with an additional limitation of "a multiplicity of multi-domain homeotropically aligned liquid crystal cells" are rejected under 35 USC 103(a) over Saito et al. in view of Lu et al. '786 as addressing in Examiner's responses to Applicants' arguments of Issue I above. The additional limitation is disclosed in the abstract of Lu et al. for improving "contrast ratio, display quality, and photo-stability".

Since claims 1 and 14 are properly rejected, the rejections of claims 4 and 17 are proper.

Issue III

Applicant's arguments are follows:

Claim 5 has been amended to depend on the newly amended independent claim 1 which further recites the limitation of a multiplicity of multi-domain homeotropically aligned liquid crystal cells. The Appellants respectfully submit that such not disclosed or taught by either Saito et al, Iwaki et al, either singularly or in combination thereof (4th paragraph on page 12).

Art Unit: 2871

Examiner's responses to Applicants' arguments are follows:

Here again, the rejection is under 35 UCS 103(a), Examiner relies on Lu et al. to teach an additional limitation of "a multiplicity of multi-domain homeotropically aligned liquid crystal cells" as addressing in Issue I above.

Claim 1 with an additional limitation of "a multiplicity of multi-domain homeotropically aligned liquid crystal cells" is rejected under 35 USC 103(a) over Saito et al in view of Lu et al. '786 as addressing in Examiner's responses to Applicants' arguments in Issue I above. The additional limitation is disclosed in the abstract of Lu et al. for improving "contrast ratio, display quality, and photo-stability".

Since claim 1 is properly rejected, the rejection of claim 5 is proper.

Issue IV

Applicant's arguments are follows:

Claim 6 depends on independent claim 1, which has been amended to further recite the limitation of "multi-domain homeotropically aligned liquid crystal cells" disclosed which is not taught by Saito et al or Lu et al, Bischel et either singularly or in combination thereof (4th paragraph on page 13).

Examiner's responses to Applicants' arguments are follows:

Claim 1 with an additional limitation of "a multiplicity of multi-domain homeotropically aligned liquid crystal cells" is rejected under 35 USC 103(a) over Saito et al in view of Lu et al. '786 as Examiner's responses to Applicants' arguments in Issue

Art Unit: 2871

I above. The additional limitation is disclosed in the abstract of Lu et al. for improving "contrast ratio, display quality, and photo-stability".

Since claim 1 is properly rejected, the rejection of claim 6 is proper.

Issue V

Applicant's arguments are follows:

Claim 7 depends on the newly amended independent claim 1, which recites a multiplicity of multi-domain homeotropically aligned liquid crystal cell, which is neither taught or disclosed by Saito et al, Lu et al and Rosenblatt et al, even when combined together (1st paragraph on page 15).

Examiner's responses to Applicants' arguments are follows:

Claim 1 with an additional limitation of "a multiplicity of multi-domain homeotropically aligned liquid crystal cells" is rejected under 35 USC 103(a) over Saito et al in view of Lu et al. '786 as Examiner's responses to Applicants' arguments in Issue I above. The additional limitation is disclosed in the abstract of Lu et al. for improving "contrast ratio, display quality, and photo-stability".

However, the Appellants admit the fact (page 14, 4th paragraph) that Rosenblatt et al teaches a liquid crystal material that is a chiral-type liquid crystal as claim 7 cited.

Since claim 1 is properly rejected, the rejection of claim 7 is proper.

Issue VI

Applicant's arguments are follows:

Claim 8 depends on the newly amended independent claim 1, while claim 18 depends on the newly amended independent claim 14. Both claims 1 and 14 recites a liquid crystal material that is a multiplicity of multi-domain homeotropically aligned liquid crystal cell, which is neither taught or disclosed by Saito et al, Lu et al, Akimoto et al, either singularly or in combination thereof (4th paragraph on page 15 to 1st paragraph on page 16).

Examiner's responses to Applicants' arguments are follows:

Claims 1 and 14 with an additional limitation of "a multiplicity of multi-domain homeotropically aligned liquid crystal cells" are rejected under 35 USC 103(a) over Saito et al in view of Lu et al. '786 as Examiner's responses to Applicants' arguments in Issue I above. The additional limitation is disclosed in the abstract of Lu et al. for improving "contrast ratio, display quality, and photo-stability".

Since claims 1 and 14 are properly rejected, the rejections of claims 8 and 18 are proper.

Issue VII

Applicant's arguments are follows:

Claims 9 and 11 depend on independent claim 1, while claims 19-20 depend on independent claim 14. The Appellants have clearly shown that the newly amended

Art Unit: 2871

independent claims 1 and 14 are not rendered obvious by Saito et al and Lu et al, since Saito et al and Lu et al do not teach or disclose a multiplicity of multi-domain homeotropically aligned liquid crystal cells (4th paragraph on page 16 to 1st paragraph on page 17).

Examiner's responses to Applicants' arguments are follows:

Claims 1 and 14 with an additional limitation of "a multiplicity of multi-domain homeotropically aligned liquid crystal cells" are rejected under 35 USC 103(a) over Saito et al in view of Lu et al. '786 as Examiner's responses to Applicants' arguments in Issue I above. The additional limitation is disclosed in the abstract of Lu et al. for improving "contrast ratio, display quality, and photo-stability".

Since claims 1 and 14 are properly rejected, the rejections of claims 9, 11 and 19-20 are proper.

Issue VIII

Applicant's arguments are follows:

1. Claim 13 depends on the newly amended independent claim 1 which now further recites the limitation of a multiplicity of multi-domain homeotropically aligned liquid crystal cells. The Appellants respectfully submit that neither Saito et al, Lu et al or Nishio et al teach or disclose such limitation, either singularly or in combination thereof. (page 18, 1st paragraph).

2. In the Response to Arguments section of the 01/15/2004 Office Action, the Examiner stated "besides, Saito also disclose any domains that can occur at such part are invisible, which in turn ensures that the display characteristics are free from any possible degradation (col. lines 63-65). Thus, Saito implies the multi-domains can be used for increasing display characteristics" (3rd paragraph on page 18).

3. The Appellants respectfully traverse such arguments as showing any desirability for combining Lu et al with Saito et al. The mere fact that Saito stated "any domains that can occur at such part are invisible" cannot be equated to a statement of showing the desirability of using a specific domain, the multi-domain homeotropically aligned liquid crystal cells, as in the present invention. As a matter of fact, the statement of many domains" of Saito et al teaches away from the present invention (4th paragraph on page 18 to 1st paragraph on page 19).

Examiner's responses to Applicants' arguments are follows:

1. Claim 1 with an additional limitation of "a multiplicity of multi-domain homeotropically aligned liquid crystal cells" is rejected under 35 USC 103(a) over Saito et al in view of Lu et al. '786 as Examiner's responses to Applicants' arguments in Issue I above. The additional limitation is disclosed in the abstract of Lu et al. for improving "contrast ratio, display quality, and photo-stability".

Since claim 1 is properly rejected, the rejection of claim 13 is proper.

Art Unit: 2871

2. Saito also discloses "any domains" (col. lines 63-65). Thus, Saito implies the multi-domains. However, Saito fails to disclose or imply the multi-domains **with the homeotropical alignment, which is disclosed in an abstract of a secondary reference of Lu et al.** Therefore, the rejection of claim 1 and 14 under 35 U.S.C. 103(a) as being unpatentable over Saito et al. '308 in view of Lu et al. '786 is proper.

3. Since Saito et al. teaches away from the present invention limitation of "a multiplicity of multi-domain homeotropically aligned liquid crystal cells"; examiner uses a secondary reference of Lu et al., which discloses in the abstract the limitation of "a multiplicity of multi-domain homeotropically aligned liquid crystal cells" to fulfill the rejection of claims 1 and 14 under 35 U.S.C. 103(a) as being unpatentable over Saito et al. '308 in view of Lu et al. '786.


For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

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July 19, 2004

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Application/Control Number: 10/032,523
Art Unit: 2871

Page 21

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